

**ATTACHMENT J.4.39**  
**EQUIPMENT AND PIPING LABELING**  
**ED-12-4016**

EQUIPMENT AND PIPING LABELING

ED-12-4016

Effective Date: September 30, 1997

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FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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<b>Title: EQUIPMENT AND PIPING LABELING</b>  <i>Compliance with this procedure is mandatory while performing the activities within its scope. Only a controlled copy may be used in the performance of work.</i>	<b>DOCUMENT NO: ED-12-4016</b>	
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### RECORD OF ISSUE/REVISIONS

<u>DATE</u>	<u>REV. NO.</u>	<u>DESCRIPTION AND AUTHORITY</u>
08/10/95	0	New procedure required to describe how Structures, Systems, and Components are labeled. Initiated by W. Kortier.
12/04/95	1	Revised procedure to include new requirements, chemicals and system designators for Dewatering Facilities and Other Waste Water Treatment Facilities. Initiated by Dexter Lunsford.
08/05/96	2	Revised procedure to include IC96-041, dated May 20, 1996 and minor editorial updates. Initiated by Dexter Lunsford.
09/30/97	3	Revised procedure to align with re-engineered Fluor Daniel Fernald organization. Incorporates IC97-036, dated 6/24/97. Initiated by G. C. Olbur.

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## 1.0 PURPOSE

This procedure establishes the guidelines and criteria for equipment and piping labeling.

## 2.0 SCOPE

This procedure is applicable to projects and activities performed or managed by FDF. The requirements of this procedure are applicable to all new facilities, selected existing facilities, and must be met prior to acceptance by the facility owner for operations.

## 3.0 REFERENCES

1. PL-3035, "Configuration Management."
2. CM-0001, "Configuration Management."
3. ED-12-4006, "Specification Preparation and Issue"
4. DOE Order 5480.19, "Conduct of Operations Requirements for DOE Facilities"; Chapter XVIII, "Equipment and Piping Labeling"
5. DOE Standard 1044-93, "Guide to Good Practices for Equipment and Piping Labeling"
6. RM-0029, Conduct of Operations (CONOPs) Program
7. ED-12-5001, "Engineering/Construction Document Control"
8. MS-1021, "Project Management"

## 4.0 RESPONSIBILITIES

Project Engineer - Responsible for integration of labeling requirements for Structures, Systems and Components (SSCs).

Project Manager (PM)/Project Engineer (PE) - Responsible for implementing this procedure for all new FEMP Projects and for selected existing and ongoing FEMP Projects.

Facilities Engineering - Maintains support and document control of approved Engineering drawings.

Facility/Project/Process Engineer - Responsible for supplying technical information as needed to assure correct labeling of all piping and equipment, assigning unique facility identification designators to components, and revising facility technical basis documentation (e.g., P&ID's) to reflect component identifiers.

Operations Manager - Ensures that facility equipment and piping is properly labeled including replacement of missing or unreadable labels.

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#### 4.0 RESPONSIBILITIES

Shift Supervisor - Responsible for promptly attaching an approved temporary replacement for missing or unreadable labels.

#### 5.0 GENERAL

Existing facilities with established labeling programs are not required to convert existing labels to the requirements of this procedure. Decision to convert existing facilities will be made by the Functional Area Manager (FAM) of Operations. However, the Label Maintenance Section is applicable to all facilities. Additionally, when new labels are added or existing labels are replaced, they should conform to the Label Design, Information, and Placement requirements in Attachment B to the extent feasible.

Facilities where detailed Engineering Design has been completed prior to issuance of this procedure, or revision thereto, need not follow the suggested format for component numbering or labeling. Labeling should only meet the intent of the requirement to label components.

One-time or short-term (less than 6 months) facility operations may, at Operations FAM discretion, use temporary labels which comply with the label content and readability specifications.

This program, Equipment and Pipe Labeling, establishes consistency among requirements, documentation and physical configuration, and maintains this consistency throughout the life-cycle, particularly as changes are made. The specific means for implementing labeling are developed in project specifications.

Piping and components that require labeling, not spelled out in this procedure, will be done regardless of size (diameter) using normal industry practices or by an engineering decision.

If noun names for valves are references in procedures, valve tags do not require noun names.

Labeling as specified by this procedure should not be confused with labels indicating Computerized Material Management System (CMMS) equipment numbers which are applied specifically for this system.

#### 6.0 PREREQUISITES

The implementation of this procedure is dependent on the performance of Design requirements and resulting determination of Facility implementation. This determination is the responsibility of the project engineer. WARNINGS, CAUTIONS, and NOTES will precede the Section, Item, Step, or Sub-step to which they apply.

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## 7.0 **PROCEDURE**

### 7.1 **ASSIGNING LABELING REQUIREMENTS**

#### **PROJECT MANAGER (PM)/PROJECT ENGINEER (PE)**

1. As part of the development of the design package, assure that components developed in Preliminary Engineering or revised during Definitive (Title II) Design are identified for labeling requirements.

#### **PROJECT ENGINEER**

2. At completion of the Definitive Design, and prior to start-up and turnover, begin preparation of the Component labeling list.
3. As design process proceeds, identify the specific components that will be contained in the specification and complete the specific list of labels that will be needed. (ref: Attachment A).
4. Following completion of the design, verify all appropriate component information is accurate by comparing the drawings with the label list.
5. If the system(s) are complex, developing the Process Flow Diagram (PFD) into a local visual aid for operators may be appropriate.

### 7.2 **LABEL SPECIFICATION REQUIREMENTS**

#### **PROJECT ENGINEER**

1. As part of the development of the project functional requirements, the scope and boundaries of the project have been identified. Verify that labeling is a requirement in the planned scope of the Project.
2. As design proceeds, verify that the specific components listed in Attachment A are contained in the specification by the design organization. (ref: ED-12-4006, "Specifications Preparation and Issue").
3. During Construction Acceptance Testing, verify that labels have been installed per specification and Attachment C.

### 7.3 **LABEL MAINTENANCE**

#### **USER ORGANIZATION**

1. Operators, maintenance personnel, and/or supervisors must promptly report missing, damaged, or incorrect labels for replacement.

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### 7.3 LABEL MAINTENANCE (cont.)

#### USER ORGANIZATION (cont.)

2. To ensure prompt identification of missing or defective labels, the Operations Manager will require a verification of labels at the following times:
  - A. During post-maintenance testing and restoration.
  - B. Upon completion of facility modifications or design changes.
  - C. During valve and switch lineup checks.
  - D. Prior to resumption of operations after a prolonged shutdown.
  - E. During facility inspections.
3. The Operations Manager will establish a procedure for recording label deficiencies as they are identified. An entry in the facility's narrative log completely identifying the affected component or piping will suffice for this purpose.
4. When a component label deficiency is reported, the Operations Manager or Shift Supervisor will install a temporary label after verifying the label information. This label will be an Information Tag, annotated with the following information:
  - A. All of the label information required by the system specification.
  - B. The authorizing Shift Supervisor's signature and date of approval.
5. Correct and follow-up on all noted labeling deficiencies until the problem is corrected.

### 8.0 RECORDS

The following records will be generated as part of this procedure:

- 8.1 Labeling identification of SSCs will be maintained in the facility records.
- 8.2 All other correspondence directing action will be processed per ED-12-5001, "Engineering/Construction Document Control, (ECDC)."



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## 9.0 DRIVERS

9.1 RM-0012, "Quality Assurance Program"

9.2 RM-0016, "Management Plan"

## 10.0 DEFINITIONS

Facilities - Structures, systems, and components (SSC); their functional systems and equipment, including site development features such as landscaping, roads, walkways, and parking areas; outside lighting and communications systems; central utility plants; utilities supply and distribution systems; and other physical plant features. A combination of equipment, structures, systems, and processes that fulfill a specific purpose.

Modification - Any change or alteration to a facility/activity or SSC which affects the form, fit, or function of equipment, systems, processes, or facilities; and which does not involve direct same-for-same replacement of components (or like-for-like, if substitutes were previously analyzed and approved) or routine maintenance utilizing approved procedures.

Operations Manager - The manager with overall responsibility for facility operation. Titles for this position vary, and include Facility Owner, Plant Manager, Area Supervisor, and Project Manager.

Project Engineer (PE) - An engineer responsible for document preparation, coordination, and/or performance of engineering functions for a project. A signature by the Project Engineer indicates that the issues involved with USQ, CM, CP, and interdisciplinary reviews have been resolved.

Project Manager (PM) - A functional position in which the designated person is in charge of managing and directing the project functions to which they are assigned. An experienced individual assigned to coordinate, integrate, and/or oversee activities for a specific project including scope, cost, schedule, quality, and customer/participant satisfaction. (See Site Procedure MS-1021, "Project Management").

Shift Supervisor - The Lead Shift Operator, directly responsible for controlling and monitoring facility operations and for directing other Shift Operators' activities during the shift. Titles for this position vary, and include Stationary Engineer, Process Leader, and Facility Operator.

Structures, Systems and Components (SSC) - Structures are elements that provide support or enclosure such as buildings, free standing tanks, basins, dikes, and stacks. Systems are collections of components assembled to perform a function such as piping, cable trays, conduit, or HVAC. Components are items of equipment such as pumps, valves, relays, or elements or a larger array such as computer software, lengths of pipe, elbows, or reducers.

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## ATTACHMENT A

### Components Requiring Labeling

The following components will be labeled as they relate to the facility:

- A. Major equipment such as pumps, motors, generators, tanks, etc.
- B. Liquid and Gaseous Fluids piping and process ventilation ducts.
- C. All valves and dampers associated with process control of a facility.
- D. Instruments, gages, and other process indicators.
- E. Electrical cabinets, distribution and lighting panels, motor control centers, circuit breakers, switches, instrument panels, cabinets, and fuses.
- F. Fire protection systems and equipment.
- G. All pipe insulation shall be labelled, "Danger Asbestos Material" or "Asbestos Free" as appropriate.
- H. Room doors.

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## ATTACHMENT B

### 1.0 Label Design

2.0 This is a sample specification for labels to be installed on components.

2.1 Label size will be based on available lighting and anticipated reading distances. Labels must be readable from the normal operation location or position, such that an Operator need not manipulate the label to read it.

- A. The minimum character height for a well-illuminated environment is 0.004 times the nominal reading distance (i.e., 0.112 inches height at 28 inches distance).
- B. The minimum character height for a poorly-illuminated environment is 0.006 times the nominal reading distance (i.e., 0.168 inches height at 28 inches distance).
- C. An exception to this would be a one-half inch diameter pipe buried in a large bank of pipes on an overhead pipe bridge, probably could not be read but should be labeled.

2.2 Labels should normally be constructed of non-reflective materials. Black characters on a white background or white characters on a black background offer the best contrast and legibility. If white-on-black engraved labels are used, a clear overcoating should be applied to prevent dirt from obscuring the white engraved characters.

2.3 Labels, including adhesives and other means of attachment, will be made from corrosion-resistant materials that are compatible with the component and environment where they are used.

### 3.0 Required Label Information

3.1 Component labels will include the following information:

- A. System designator (per Attachment D): an abbreviation used to identify the system of which the labeled component is a part. Example: "PA" for a Plant Air system.
- B. Component function: an abbreviation used to identify the type of component. Example: "PRV" for a pressure regulating or reducing valve.
- C. Component number: a sequential number used to differentiate similar components in a system.

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## **ATTACHMENT B**

### **3.0 Required Component Label Information (cont.)**

- D. Noun name: a concise, meaningful description of the function or service of the component. Example: "Air Compressor No. 1 Outlet".
- E. Power Supply: for electrical components, used to identify the motor control center or distribution panel from which the component is powered.
- F. The label for a Motor-Driven Air Compressor would have the following format:  

PA-COMP-001  
Air Compressor No. 1  
MCC-3

### **3.2 Additional information is required on labels for specific components:**

- A. Labels on electrical cabinets, panels, and equipment will indicate the maximum voltage present.
- B. Labels on room doors will identify the major purpose of equipment items contained within the room.
- C. Labels on pneumatic actuators will identify the Air System Isolation Valve.

### **3.3 Component numbers and noun names must be consistent among engineering drawings, operating and maintenance procedures, valve and electrical lineup sheets, and component labels. Drawings, procedures, and labels will use the identical name and number nomenclature for the component.**

### **3.4 If the facility technical basis documentation does not provide a listing of System Designator Codes, then the codes in Attachment D will be used.**

### **3.5 All labels associated with the same component will use identical nomenclature. For example, the labels for the motor control center breaker, field disconnects, local and remote control switches, instrumentation, motor, pump, valves, and gages associated with a given pump will include the name of the pump.**

### **3.6 Where space does not permit placement of all information, priority will be given to the following information in order: Component function and number, then noun name, then power supply.**

### **4.0 Required Piping Label Information**

- 4.1 Piping will be labeled to indicate the media contained and the normal flow direction. Arrows will be used with labels to indicate the direction of flow. The piping itself, or the label and arrow, will be color coded to indicate the contents and level of hazard. The color codes in Attachment C will be used for this purpose.

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## **ATTACHMENT B**

### **Label Placement**

#### **5.0 Components**

- 5.1 Component labels will be placed on or as near as practicable to the equipment to be labeled, positioned so that they are readily visible, and oriented in a horizontal/vertical position where feasible.
  - A. Both ends of the extension of remote, Mechanically Operated (reach-rod) Valves will be labeled.
  - B. Chain-Operated Valves will be labeled at the valve and also at the chain operating position. Chain labels will be placed on a small piece of plastic pipe or metal ring through which the chain can easily pass, so the label always remains at the bottom of the chain loop. Ty-wraps can be used as a means for attaching labels to chain operated and other valves.
  - C. When the valve cannot be clearly seen from the operating location, the label will indicate the open or close direction for the Remote Operator.
  - D. Labels on Valve Manifolds and labels for components and indicators on control or distribution panels will be placed closer to the identified component than any other component so that the label clearly identifies the correct component.
  - E. In addition to the above locations, piping systems or pipe bridges shall be labeled at intervals so that at least one label can be seen in each direction along the pipe from any one point on the ground or floor.
- 5.2 Labels will be permanently attached by either using stainless steel wire or ty-wraps appropriate to the environment of equipment and piping locations.
- 5.3 Labels will normally be oriented horizontally so they can be read from left to right. If equipment or piping configuration requires that the label be oriented vertically, then the label should be oriented so that the characters are themselves oriented normally and read from top to bottom. If this is not possible, orient tags in such a manner they can be read from floor either left to right or right to left on either side of the piping configuration.
- 5.4 Label placement must not obscure indicators nor interfere with equipment operation. Valve Label attachment devices will be threaded through the valve yoke and label plate, not through valve handwheels or remote operating chains, reach-rods, or linkages.

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## **ATTACHMENT B**

### **6.0     Piping**

6.1     Piping labels with arrows are required in the following locations:

- A.     Close to valves or flanges.
- B.     Adjacent to changes in direction and branches.
- C.     Both sides of barrier penetrations, where pipes pass through walls or floors.
- D.     At intervals on straight piping runs sufficient for identification.

Note: Multiple labels are not required where there are several changes in direction or branches within clear view of at least one label.

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## ATTACHMENT C

### PIPING CONTENTS COLOR/LEGEND CODE

<u>Piping Contents</u>	<u>Label Color</u>	<u>Legend Color</u>
Inherently hazardous materials (e.g., flammable, chemically active, toxic, temperatures above 200°F, pressures above 500 psi, radioactive)	Yellow	Black
Low-hazard liquids with temperatures at or below 200°F and pressures below 500 psi	Green	White
Low-hazardous gases with temperatures at or below 200°F and pressures below 500 psi	Blue	White
Fire quenching materials	Red	White

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**ATTACHMENT D**  
**SYSTEM DESIGNATOR CODES**

<u>SYSTEM</u>	<u>PREVIOUS CODE</u>	<u>CODE</u>
<u>Acid Systems</u>		
Hydrofluoric acid	AD	HF or AHF
Dilute Hydrofluoric acid	DHF	DHF
Nitric	AN	AN
Sulfuric Acid	SB	SULF

Air Systems

Air, Blower	BA	BA
Air, Breathing	SA	SA
Air, Compressed	-	CA
Air, Instrument	SA	IA
Air, Plant	PA	PA
Heating, Ventilation, & Air Conditioning	HVA	HVA

Electrical Systems

***Note: Conduits, wireways, and panel boards shall be labeled when voltage is 600 volts or greater. Low voltage conduits and wireways (600 volts or less) will not require labels.***

- Conduits shall be labeled when it leaves a circuit breaker box, both side of pull boxes/junction boxes and when it enters and exits a penetration in the floor, partition, or wall.
- Wireways shall be labeled when it exits a motor control center, switch gear cabinet, circuit breaker box and when it enters and exits a penetration in the floor, partition, or wall.
- Only exception to this is that all circuit breaker boxes will be labeled as 120V, 240V, 480V, or 600V, etc.

Gaseous Systems

Ammonia	GA	NH3G or AMMG
Anhydrous Hexafluoride	AG	UFG
Fuel Gas, general	FG	FG
Hydrogen	HN	HN
Methane	FG2	FG2
Nitric Acid	AN	HNO3 or NA
Nitric Acid Vapor	NV	HNO3V



**ATTACHMENT D****SYSTEM DESIGNATOR CODES (cont.)**

<u>SYSTEM</u>	<u>PREVIOUS CODE</u>	<u>CODE</u>
<u>Gaseous Systems</u>		
Nitrogen	NG	NG
Nitrogen Oxide Vapor	NV	NOX
Propane	FG1	FG1
Vent	VE	VE
<u>Other Fluid Systems</u>		
Contaminated Sewer	CE	CE
Contaminated Rinse	CR	CR
Hydraulic Fluid, below 500 psi	HF2	HF2
Hydraulic Fluid, 500 psi or greater	HF1	HF1
Kerosene	KE1	KE1
Lime Slurry	SR3	LIMSL or SR3
Liquid Ammonia	NH	NH3
Liquid Ammonium Hydroxide	HA	NH4OH
Liquid Anhydrous Hexafluoride	AA	UFGL
Lubricating Oil	LO	LO
Potassium Hydroxide	PH	KOH
Seal Oil	SO	SO
Sodium Hydroxide	NA	CAUS or NAOH
Sump Liquor, Nitric Acid	SL3	SUMPHNO3
Sump Liquor, Treated (Filtrate)	SL4	FLT
Sanitary Sewer	SN	SN
Storm Sewer	ST	ST
<u>Steam Systems</u>		
Steam, 0-10 psi	LS1	LS1
Steam, 11-150 psi	LS	LS
Steam Condensate	CN	CN

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## ATTACHMENT D

### SYSTEM DESIGNATOR CODES (cont.)

<u>SYSTEM</u>	<u>PREVIOUS CODE</u>	<u>CODE</u>
<u>System Designators for Dewatering Facility and Other Waste Water Treatment Facilities</u>		
Miscellaneous Slurry	-	MS
AWWT Slurry	-	AS
Treated Slurry	-	TS
Filter Feed	-	FF
Filtrate (and clarifier overflow)	-	FLT
Sump	-	SUMP
Sample	-	SMPL
Diatomaceous Earth	-	DE
Polymer	-	POLY
Alum	ALUM	
Caustic	-	NAOH
Ferric Chloride	-	FECL
Sulfuric Acid	SB	H2SO4
<u>Water Systems</u>		
Boiler Feedwater	BF	BF
Cooling Water Supply	WS	WS
Cooling Water Return	WR	WR
Deionized Water	PW	PW
Domestic Water	DW	DW
Fire Protection, above ground	FP	FP
Fire Protection, underground	FQ	FQ
Potable Water	DW3	DW3
Process Water	TW	TW
Process Liquid Waste	LPW	LPW
Raw Water, above ground	RW	RW
Raw Water, underground	RW2	RW2
Sanitary Service Water	DW2	DW2
Sanitary Water, underground	DW1	DW1
Steam Condensate	CN	CN